

# Estimating Deaths from Opioid Overdoses in the US

## Project Goals

The aim of the project is to estimate and disseminate situational awareness of deaths resulting from suicides and drug overdoses in the US to support public health action, which could be particularly relevant in the context of the increasing mortality from suicides and drug poisonings in the US. We have primarily focused on opioid overdoses.

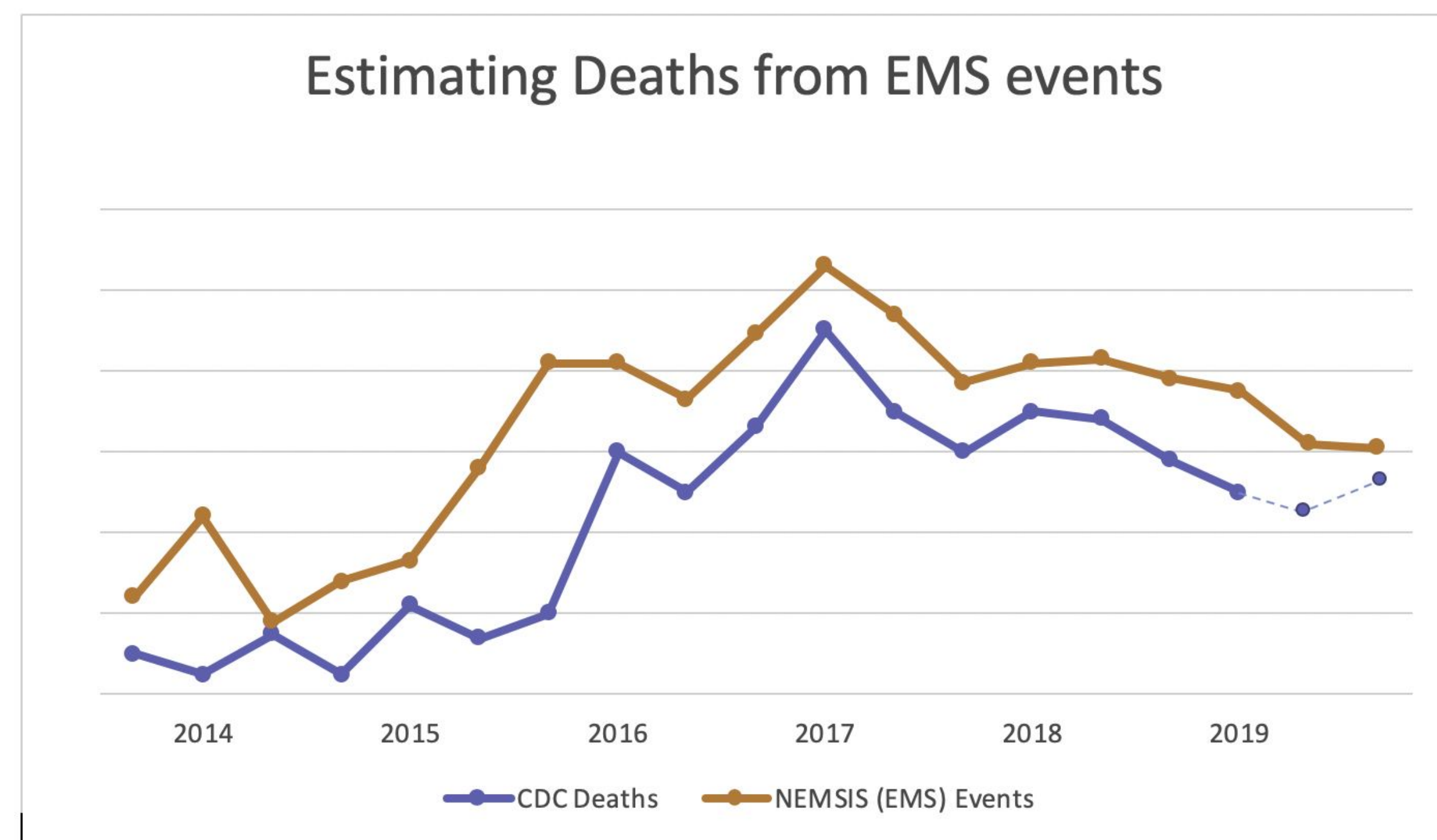


Figure 1. Near Realtime Naloxone EMS events from the NEMSIS system and opioid overdose deaths from the CDC WONDER Mortality Rates (until 2017) plus Provisional Data from 2018 to April 2019

## The Data

To perform our analysis we extracted data from the NEMSIS and CDC Wonder systems. Shown below are the many disparate data sources that were explored along with the corresponding time periods for which they were available.

The EMS events in NEMSIS by Medication Administered provided the longest time overlap for our model training.

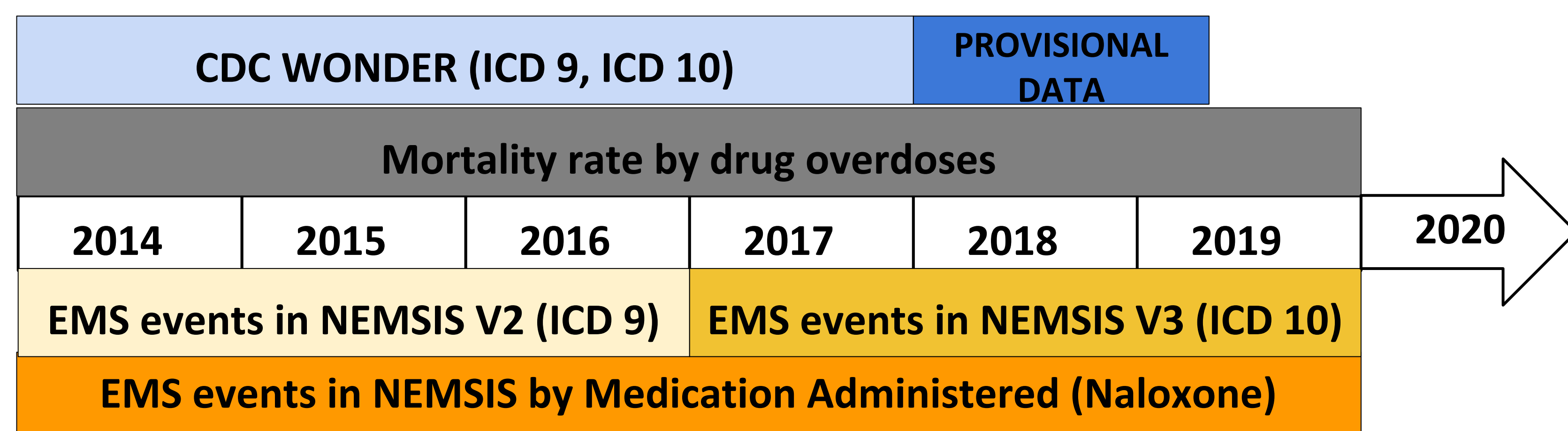


Figure 2. Diagram representing the data sources for different time periods

## Results

Here, we trained a simple linear regression model with NEMSIS counts for a region or the country in a given month as predictors, and the corresponding CDC opioid-related death counts for that area in the same month as response.

On a held-out test set of 20% of our data points, the mean squared error is 90528.07 and the  $R^2$  score is 0.95. We used this model to predict death counts for the latest months in our NEMSIS data, for which CDC data does not yet exist, as shown below.

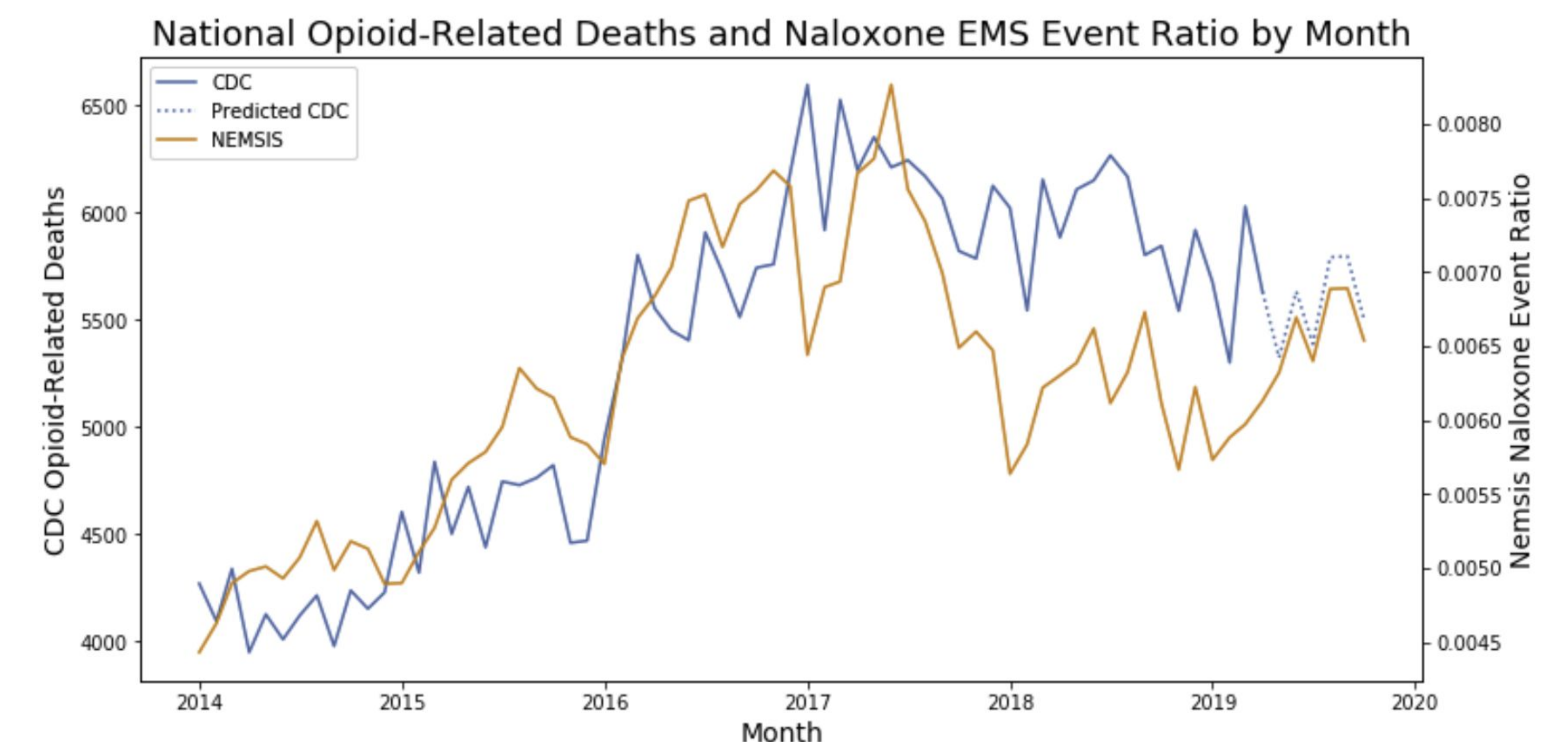


Figure 3. Predictions for National Opioid-Related Deaths and Naloxone EMS Event Ratio by Month

## Conclusions

We found EMS events in which Naloxone was administered to be a strong predictor ( $R^2 = 0.95$ ) of national opioid-related deaths. A study from Australia had found that ambulance calls for opioid overdoses and opioid deaths are correlated (Di Rico 2018). Our project lends further credence to the hypothesis that EMS data can be used as an early indicator of trends in opioid deaths.

Future research could explore the relationship between Naloxone EMS events and opioid deaths in greater depth, or look at whether there are any EMS events that can be effective proxy variables of suicides in the US.

## Acknowledgments

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## References

Di Rico, R., Nambiar, D., Stoové, M. *et al.* Drug overdose in the ED: a record linkage study examining emergency department ICD-10 coding practices in a cohort of people who inject drugs. *BMC Health Serv Res* 18, 945 (2018) doi:10.1186/s12913-018-3756-8